



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|----------------------------------|-------------|----------------------|---------------------|------------------|
| 10/561,381 | 12/16/2005 | Shafidul Islam | 102423-108 | 9287 |
| 27267 | 7590 | 05/27/2009 | EXAMINER | |
| WIGGIN AND DANA LLP | | | YEUNG LOPEZ, FRFJH | |
| ATTENTION: PATENT DOCKETING | | | ART UNIT | |
| ONE CENTURY TOWER, P.O. BOX 1832 | | | PAPER NUMBER | |
| NEW HAVEN, CT 06508-1832 | | | 2826 | |
| | | | MAIL DATE | DELIVERY MODE |
| | | | 05/27/2009 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/561,381

Applicant(s)

ISLAM ET AL.

Examiner

FEI FEI YEUNG LOPEZ

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12, 21 and 22 is/are pending in the application.
- 4a) Of the above claim(s) 13-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12, 21 and 22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 January 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

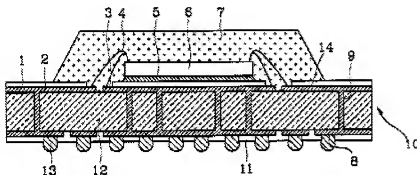
DETAILED ACTION

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 1-5, 9-12, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi (PG Pub 2002/0105077 A1) in view of Kuo et al (PG Pub 2002/0197842 A1).

Regarding claim 1, Choi teaches a package for encasing at least one semiconductor device, comprising: a lead frame (e.g. layer 14 in fig. 1) having opposing first and second ends, said first ends of said lead frame terminating in an array of lands (portions of layer 2 under layer 9 on the left and right of fig. 1) adapted to be bonded to external circuitry (solder balls 13) and said second ends terminating at an array of chip attach sites (layer 2) that are electrically interconnected *by interconnections (wires 4)* to input/output pads on said at least one semiconductor device (through wires 4); *said chip attach sites disposed opposite said input/output pads*; a plurality of electrically isolated routing circuits (layer 9) electrically interconnecting individual combinations of said array of lands and said array of chip attach sites; a first molding compound (layer 11) disposed between individual lands of said array of lands; and a second molding compound (layers 7 and 12) encapsulating said at least one semiconductor device, said array of chip attach sites and said routing circuits. However, Choi does not teach that the array of chip attach sites are directly electrically interconnected to input/output pads on said semiconductor device. In the same field of endeavor, Kuo teaches a flip chip for the benefit of providing a better performance device (paragraph [0004]). Thus, it would

have been obvious to one of ordinary skill in the art at the time of the invention to use a flip chip as the semiconductor device for the benefit of providing a better performance device. Note that the combined teaching of Choi and Kuo meets the claimed limitation that the array of chip attach sites are directly electrically interconnected to input/output pads on said semiconductor device. *Note that whether "the lead frame" is "formed from an electrically conductive substrate" or from two different electrically conductive substrates then attached together is a process by which the product is made and does not carry patentable weight in a product claim, since prior art teaches all structural limitations. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process."* In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP 2113.

FIG. 1 (PRIOR ART)



Regarding claim 2, Choi teaches the package of claim 1 wherein said lead frame and said routing circuits are elements of a single electrically conductive substrate (substrate 10 in fig. 1).

Regarding claim 3, Choi teaches the package of claim 2 wherein said single electrically conductive substrate is copper (paragraph [0008]).

Regarding claim 4, Choi teaches the package of claim 2 wherein a first perimeter defined by said array of lands (layers 2 is within the left and right borders of chip 6, see fig. 3) does not exceed a second perimeter defined by said at least one semiconductor device.

Regarding claim 5, Choi teaches the package of claim 4 being a chip scale package (see fig. 1).

Regarding claim 9, Choi teaches the package of claim 2 further including a die pad (layer 3 in fig. 1) for bonding one of said at least one semiconductor devices, said die pad being monolithic with said lead frame.

Regarding claim 10, Choi teaches the package of claim 2 further including bond sites for bonding a passive device (elements 13 in fig. 1), said bond sites being monolithic with said lead frame.

Regarding claim 11, Choi teaches the package of claim 2 wherein said array of lands (layers 2 on the left and right under layer 9 in fig. 1) and said first molding compound (layer 11) are coplanar.

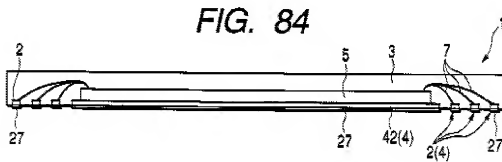
Regarding claim 12, Choi teaches the package of claim 2 wherein said array of lands (layers 2 on the left and right under layer 9 in fig. 1) extend beyond said first molding compound (portions of layer 2 contacting areas indicated 8 and 13 exceed the leftmost and on the rightmost portions of layer 11 under substrate 10 and to the right of portions indicated 8 and 13, respectively, see fig. 1).

Regarding claim 21, Choi teaches the package of claim 1 wherein the chip attach sites are not coplanar with the routing circuits (note that one is above the other, see fig. 1).

3. Claims 6-7 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over over Choi (PG Pub 2002/0105077 A1) in view of Kuo et al (PG Pub 2002/0197842 A1) as applied to claim 2 above, and further in view of Shimanuki et al (PG Pub 2002/0168796 A1).

Regarding claim 6, the previous combination remains as applied in claim 2. However, the previous combination does not teach that a distance between said at least

one semiconductor device and said muting circuits is at least 75 microns. In the same field of endeavor, Shimanuki teaches a distance (the thickness of layer 4 in fig. 84) between at least one semiconductor device (layer 5) and a routing circuits (layer 27) is at least 75 microns (see paragraph [0187]). Choi also teaches that a space defined by said distance is filled with said second molding compound (layer 12 in fig. 1). Also note that discovery of an optimum range is well within the level of ordinary skill in the art, and such ranges will not support patentability unless there is evidence of its criticality. In re Aler, 220 F.2d 454.456.



Regarding claim 7, Shimanuki teaches said distance is from 100 microns to 150 microns (0.15 mm, see paragraph [0187]).

Regarding claim 22, the previous combination remains as applied in claim 2. However the previous combination does not teach that a distance between said at least one semiconductor and said routing circuits be at least 25 microns. Shimanuki teaches a distance (the thickness of layer 4 in fig. 84) between at least one semiconductor

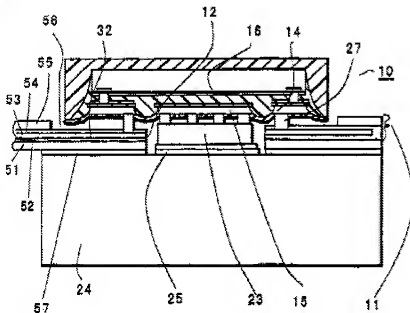
device (layer 5) and a routing circuits (layer 27) is at least 75 microns (see paragraph [0187]). Choi also teaches that a space defined by said distance is filled with said second molding compound (layer 12 in fig. 1). Thus, it would have been obvious to make the chip attach sites in Choi's device at least 75 micron thick, as disclosed by Shimanuki (layer 4 in fig. 1). Also note that discovery of an optimum range is well within the level of ordinary skill in the art, and such ranges will not support patentability unless there is evidence of its criticality. In re Aler, 220 F.2d 454.456.

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi (PG Pub 2002/0105077 A1) in view of Kuo et al (PG Pub 2002/0197842 A1) as applied to claim 2 above, and further in view of Sakamoto et al (US Patent 6,967,401 B2).

Regarding claim 8, the previous combination remains as applied in claim 2. However, the previous combination does not teach a heat sink that is a single electrically conductive substrate with said lead frame and coplanar with said array of lands. In the same field of endeavor, Sakamoto teaches a heat sink (layer 15 in fig. 1B) that is coplanar with an array of lands (elements under layer 15 in fig. 1B) for the benefit of dissipating heat from a semiconductor device (abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to include a heat sink under layer 9 and between layers 9 and 2 in fig. 1 of Choi's that is coplanar with the array of lands for the benefit of dissipating heat from the semiconductor device. Note that the combined teaching of Choi and Sakamoto meet the claimed limitation that the

heat sink is a single electrically conductive substrate with a lead frame since it is attached to layer 2 and sealed by layer 11 in fig. 1 of Choi's.

FIG. 1B



Response to Arguments

Applicant's arguments filed on January 21, 2009 have been fully considered but they are not persuasive as noted above in the claim rejections.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FEI FEI YEUNG LOPEZ whose telephone number is (571)270-1882. The examiner can normally be reached on 7:30am-5:00pm Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Feifei Yeung-Lopez/
Examiner, Art Unit 2826

/Minh-Loan T. Tran/
Primary Examiner
Art Unit 2826